THE PROVEN PROVING GROUND

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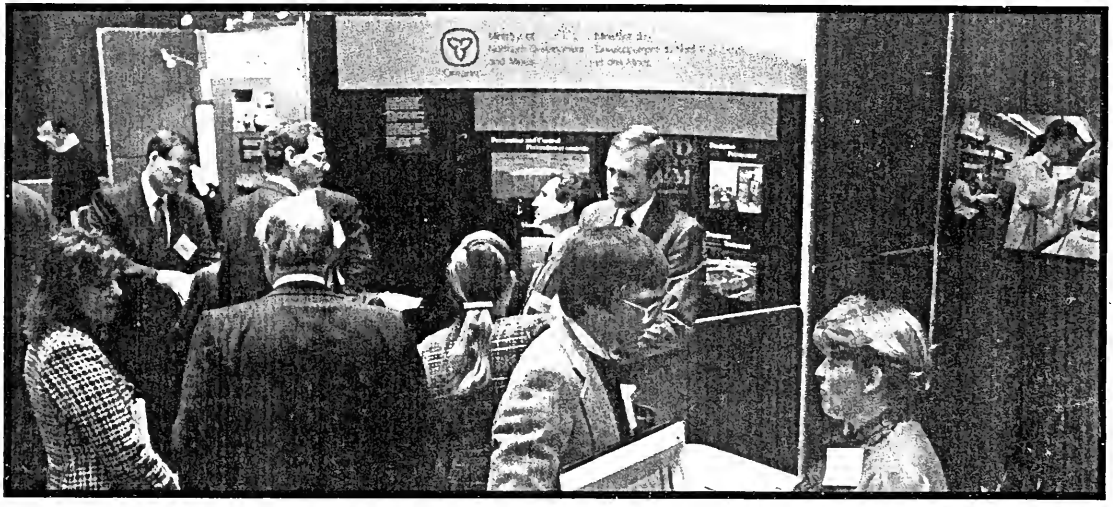
ENVIRONMENTAL RESEARCH & TECHNOLOGY DEVELOPMENT

1992 Technology Transfer Conference "Partnerships in Pollution Prevention"



Almost 600 people participated in the successful 13th annual Technology Transfer Conference held on November 5 and 6, 1992 in Toronto. A number of workshops on ministry programs and policy directions and over 200 feature, verbal and poster presentations were made.

Addressing the conference plenary session, Ruth Grier, then Minister of the Environment, introduced the ministry's Pollution Prevention Pledge Program, which encourages voluntary industrial efforts aimed at preventing pollution (see page 4). This announcement addresses an earlier call in the session from Mr. Denis Wilcock, President and CEO of Dow Chemical Canada, who had emphasized the need for regulatory agencies to work in concert with industry to implement environmental protection strategies.

The 1992 conference was structured to support the theme, "Partnerships in Pollution Prevention", and much interest was focussed on the Partners' Forum, an exposition and expanded poster session intended for "enablers" of the technology development process, those who might participate in or help create partnerships.

Among the participating organizations at the forum were the Great Lakes Pollution Prevention Centre, Industry, Science and Technology Canada, the Canadian Industrial Innovation Centre, and the Ontario Centre for Materials Research. (For a full listing of forum participants, see page 3). The Partners' Forum sessions were well received by conference delegates with 86 per cent of those returning conference evaluation forms rating the new session concept favourably.

See Conference pg 2

Pollution Prevention is a fundamental principle guiding current ministry activities. To help make pollution prevention a reality, the Ministry of Environment and Energy is realigning a number of its grant programs to focus them on technological innovations for pollution prevention. This restructuring will lay the groundwork for new partnerships among governments, universities, private companies and venture capital.

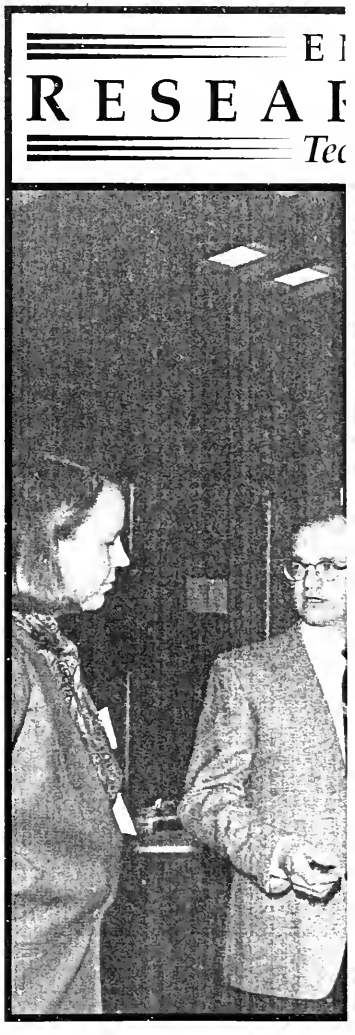
By harnessing and coordinating the resources of government, industry and the academic community, Ontario's potential in the environmental services industry can be fully realized. The 1992 Technology Transfer Conference with its theme of "Partnerships in Pollution Prevention" and introduction of a unique Partners' Forum was arranged to allow all players in the economic advancement of Ontario to be assembled and begin this task.

In conjunction with the Ministry of Economic Development and Trade, the ministry has also recently developed a Green Industry Strategy. Its goal is simple: to assemble the forces of Ontario's industrial know-how, to network its scientific institutions, and to tap the potential of market force incentives to produce the new economy that will create the jobs of the future.

To further promote Ontario industry, the ministry is creating an Environment Business Development Unit. The services of this unit will include: developing and sharing information on technology, providing business support, assisting technology transfer and application, facilitating financial assistance, and fostering Ontario and international market development.

With partnerships, an economy can be built in which Ontario companies are leaders in the development and marketing of environmental technologies, and whose citizens will enjoy the financial and social benefits.

This is the fifth issue of The Proving Ground. May you find it as interesting and informative as previous editions.



Limited quantities of the Final Program and Proceedings of the 1992 Technology Transfer Conference are available by contacting the ministry's Research and Technology Branch at (416) 323-4657.

Conference (continued)

In an innovative move, the full text of conference technical presentations were provided on computer disk in WordPerfect 5.1 instead of the large paper volumes of previous years. This substitution replaced over 800 pages of text with three 1.44mb disks for each delegate's copy of the conference proceedings. Some figures and tables still had to be provided on paper, because in computer format they require so much memory that too many disks would have been needed.

While the true accomplishments of the 1992 conference can only be gauged in the years ahead, the underlying spirit of cooperation evident among the industry, financial organization, research agency and government stakeholders present suggests that the 13th Technology Transfer Conference represented a landmark occasion in the development of productive partnerships for ensuring environmental protection in Ontario.

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ology Transfer Conference

This issue of The Proving Ground reports on a number of the events and presentations at the 1992 Technology Transfer Conference, including reports on several environmental research and technology development projects profiled in previous editions

- Rowan Williams Davies & Irwin Inc.
- Ontario Ministry of Industry, Trade and Technology
- The Canadian Industrial Innovation Centre/Waterloo
- Brock University
- Office of Pollution Prevention, Centre for Industrial Services, University of Tennessee
- The Development Corporations of Ontario
- Environment Canada, The Great Lakes Cleanup Fund
- Wastewater Technology Centre
- Toronto Venture Group
- Waterloo Centre for Groundwater Research
- Ontario Centre for Materials Research
- American Water Works Research Foundation
- Air and Waste Management Association
- Canada Centre for Mineral and Energy Technology
- Mine Environmental Neutral Drainage - Ontario
- York University, Technology Transfer Office, Innovation York
- Ontario Hydro Research Division
- Ontario Ministry of Energy

Partners' Forum participants

- Great Lakes Pollution Prevention Centre
- ORTECH International
- Environment Canada, Technology Development Branch
- The Ottawa-Carleton Economic Development Corporation
- National Research Council of Canada, Institute for Environmental Chemistry
- Science and Professional Services Directorate, Unsolicited Proposals Brokerage Service and Environmental Innovation Program
- Industry, Science and Technology Canada
- Canadian Hazardous Materials Management Inc.

P^4 Pollution Prevention Pledge Program

In an address on the first morning of the 1992 Technology Transfer Conference, Ruth Grier, then Minister of the Environment, announced the Pollution Prevention Pledge Program (P^3), a voluntary industrial program that will use innovation and pollution prevention strategies to help achieve major reductions in toxic releases.

The program challenges industry to collectively achieve a 50 per cent reduction in the release of certain persistent chemicals and classes of hazardous wastes by the year 1995 and a 90 per cent reduction by the year 2000. It will also accept submissions from companies for reduction of any other pollutant released into the Ontario environment, or hazardous waste classifications designated under Regulation 347.

The first formal program initiative undertaken by the ministry's Pollution Prevention Office, P^4 will recognize and acknowledge four progressive levels of commitment.

P^1 Registration/Planning Level
At the most basic level, companies can register a commitment to develop a pollution prevention plan or make a toxic use and/or hazardous waste reduction commitment within one year. This plan can apply to an entire company or to individual facilities within the company.

P^2 Reduction Commitment Level
Companies or facilities make specific public commitments to reduce or eliminate the release or disposal of chemicals and/or hazardous waste at individual sites within their own specific timeframe.

P^3 Reduction Achievement Level
Companies acknowledged at this level will have achieved significant reductions in the release of toxic chemicals and/or generation of hazardous wastes. To enter into the Reduction Achievement Level, facilities must have achieved a 20 per cent net reduction in release of toxic substances or attained 50 per cent of their total reduction commitment.

P^4 Pollution Prevention Achievement Level
Many companies will have achieved significant reductions in the generation of hazardous wastes and/or release of pollutants by avoiding their creation. These companies will be eligible to win a ministry Pollution Prevention Award and the right to use the ministry's new pollution prevention symbol.

Through the Pollution Prevention Pledge Program, the ministry will acknowledge Ontario's good corporate citizens, industries that have voluntarily used pollution prevention principles and gone beyond the basic regulatory requirements to achieve environmental benefits. It will promote and broaden the use of pollution prevention planning and will foster ministry/industry partnerships and cooperation not only for toxic reduction programs, but also for other environmental technologies research activities.

For further information on the Pollution Prevention Pledge Program, contact:

Pollution Prevention Office
Ministry of Environment and Energy
2 St. Clair Ave. W., 12th Floor
Toronto, Ontario
M4V 1P5

Fax: (416) 323-5166
Telephone: (416) 323-5095

Pollution Prevention - An Industry Success

The first Honorary Pollution Prevention Award was presented at the 1992 Technology Transfer Conference to Mr. Dennis Burgin, Plant Manager of Essex Specialty Products Inc. Canada of London, Ont. in recognition of his company's outstanding efforts in preventing pollution. The award consisted of a commissioned work of art in recycled glass on which was inscribed the ministry's pollution prevention symbol.

Essex makes adhesives for bonding glass and other materials onto cars and trucks. Over the past three years, the company and its seven employees have made changes to their manufacturing processes that have prevented the generation of over 35,000 litres of hazardous waste each year. In addition to reduced pollution, the company now saves over $160,000 annually in reduced costs of raw materials and disposal charges.

Electric Vehicles What would the net environmental benefit be?

Cars pollute. Otherwise known as internal combustion engine motor vehicles (ICEVs), they produce emissions which degrade air quality particularly in an urban environment, contribute to the greenhouse effect, to acid rain, and to ground level ozone, and add toxic materials and particulates to the air. Consequently, interest in electric vehicles (EVs) as an alternative means of transport is intense.

While EVs do not produce any emissions during their operation, this is not so for some of the power stations which generate the electricity which EVs require. The question of whether EVs offer any significant environmental benefit when such emissions are taken into account was the subject of a poster presentation by Dr. William Adams of the Electrochemical Science and Technical Centre, University of Ottawa, in the Environmental Technology Development section at the 1992 Technology Transfer Conference.

Dr. Adams has conceived a computer model which allows more precise forecasts of the net environmental effects of large-scale EV introduction. The model calculates ICEV emissions according to the fuel used, and computes EV emissions from the regional power plant fuel mix and average EV efficiency. Then, given the average distance driven annually per car, the total number of cars in the region, and the percentage of those cars which are EVs, the program calculates the region's relative change in absolute annual emissions.

Sample calculations presented at the conference indicated the potential reduction in emissions on a per kilometre basis which could be achieved by replacement of gasoline powered ICEVs with EVs in three Canadian provinces (see diagram below).

This new model provides an invaluable first insight into the complex question of the potential environmental impact of commercial EV technology. Such future work as including the effect of seasonal variations in ICEV emission profiles and efficiency of EVs will further increase its accuracy. Dr. Adam's ultimate intention is to use the model to enable the analysis of regions varying in size from the country as a whole, to individual provinces and cities.

This project is supported by the Environmental Research Program

A Comparison of EV vs. ICEV (gasoline) Emissions in Three Provinces
(expressed on a grams per kilometre basis)

HC Hydrocarbons
CO Carbon Monoxide
NO_x Nitrogen Oxides
CO_2 Carbon Dioxide
SO_2 Sulphur Dioxide


EV


ICEV

1. B.C. (Vancouver)

	EV	ICEV*
HC	0.00022	2.61
CO	0.0028	22.2
NO_x	0.040	1.58
CO_2	13	288
SO_2	0.0023	0

2. Alberta (Calgary)

	EV	ICEV*
HC	0.0037	2.30
CO	0.065	19.1
NO_x	0.50	1.68
CO_2	211	288
SO_2	0.72	0

3. Ontario (Toronto)

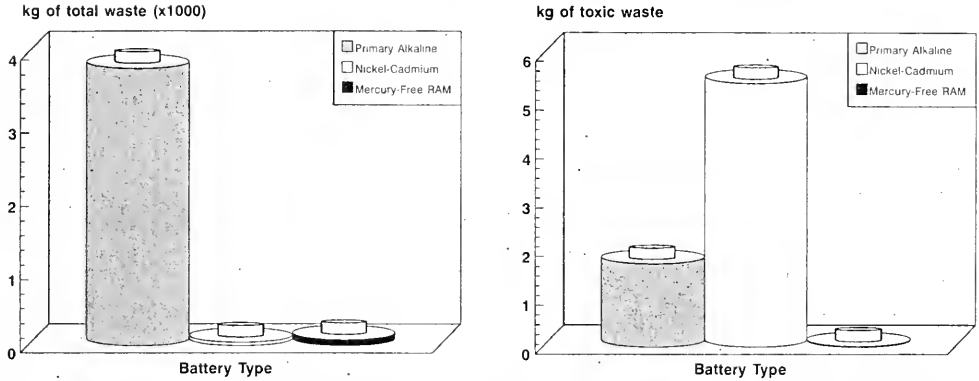
	EV	ICEV*
HC	0.0013	2.19
CO	0.012	18.7
NO_x	0.10	1.46
CO_2	63	288
SO_2	0.34	0

* Average values for the current regional fleet (emission standards for new vehicles are lower)

Mercury-free rechargeable batteries Ex-cell-ent performance

Small format batteries represent an $11 billion (US) business annually worldwide. Consequently, billions of them are discarded every year. Hazardous chemicals such as lead, cadmium and mercury are thereby deposited in landfill sites and may be introduced into groundwater, or released into the atmosphere when waste containing batteries is incinerated.

Recently developed rechargeable mercury-free AA batteries promise a significant reduction in the quantities of toxic and solid waste introduced into the environment



Total Waste and Toxic Waste Created by a Portable Music System Powered by Single Use Primary Alkaline, and Rechargeable Nickel-Cadmium and Mercury-Free RAM Cells. (1,000 units containing two AA cells each, operating for 4 hours a day over a period of a year). **Note the difference in scale between the two graphs.**

In late 1990, Battery Technologies Inc. (BTI) then of Mississauga, Ont. initiated development of rechargeable, mercury-free AA batteries based on their reusable alkaline manganese dioxide (RAM) - zinc technology. This technology development project was recently completed seven months ahead of schedule.

On the second day of the 1992 Technology Transfer Conference, in the verbal session "Hazardous Waste Management Through the 90s", Dr. Klaus Tomantschger gave a persuasive argument that BTI's newly developed batteries have comparable performance characteristics and considerable environmental advantages relative to existing alternatives.

Test results indicated that the new RAM cell's overall performance exceeds by more than 10 per cent, the minimum average standards for alkaline cells set by the International Electrochemical Commission. These tests involve assessment of battery electrical performance in such applications as transistor radios, camera photoflashes, small motors and toys, and personal stereo equipment like the Walkman.

The environmental advantages of the mercury-free RAM battery were demonstrated by modelling the total waste and toxic waste generated by a portable music system powered by single-use alkaline, and rechargeable nickel-cadmium and alkaline manganese dioxide cells. The calculation was based on 1,000 units operated by two AA cells for four hours a day over a period of a year (see diagram below).

Although the total waste produced by nickel-cadmium batteries, due to their high cycle life, compared favourably with primary alkaline and RAM cells, the toxic waste generated greatly favours the use of RAM cells. In this model application, the total toxic waste generated for nickel-cadmium cells amounted to 5.4 kg, for primary alkaline cells to 1.7 kg, and for mercury free RAM cells a mere 12 grams. This clearly demonstrates the environmental benefits that mercury-free RAM cells offer compared to single use and other rechargeable systems.

BTI's developmental work suggests that the new RAM cells have the potential of providing the consumer with an environmentally-friendly, low-cost secondary cell which maintains nearly all characteristics of the popular primary alkaline system.

This project is supported by the Environmental Technologies Program

Vitrokele™ adsorbents - environmentally and economically attractive

Profiting from pollution prevention was the theme of a verbal presentation by Dr. Denis Kidby of Jasmetech Metal Technologies of Guelph, Ont. on the first day of the 1992 Technology Transfer Conference. In line with the session theme, "Treating Mine Effluent: An Economic Opportunity", Dr. Kidby presented model calculations supporting his claim that incorporating a closed-loop cyanide and metal recovery and recycling circuit based on Vitrokele™ adsorbents in a gold milling operation, as a pollution prevention strategy, could also be highly attractive from an economic perspective.

Dr. Kidby's analysis was based on a gold mill processing one million tonnes of ore per year, for which a capital expenditure of $3.6 million would be required for a recycling unit. With credits from recovered cyanide and such metals as copper projected to be about $5.23 million per year, the annual net revenue for the gold mill would be $2.96 million once operating costs of $2.27 million were deducted. The payback period for such an investment could therefore be as little as 16 months. Beyond that point, this pollution prevention strategy would be returning a profit.

An alternative application for Vitrokele™ adsorbents is in the restoration of sites containing soil contaminated by such metals as lead and cadmium. This had been the subject of an earlier verbal presentation by Dr. Bruce Holbein of Tallon Metal Technologies Inc. of Guelph, Ont. at the "Soil Remediation: Continuing Challenges" session. Tallon Metal Technologies is the parent company of Jasmetech.

Vitrokele™ adsorbents may have profitable and environmentally beneficial application in both the mining industry and in the restoration of sites contaminated by metals

Tallon's technology consists of a series of conventional mineral processing techniques for contaminated soil, and proprietary procedures for extraction, treatment and recovery. The final stage of the process employs a treatment circuit similar to that employed in the mining industry application whereby liberated metals are adsorbed onto the Vitrokele™ and subsequently recovered as a metal concentrate for off-site recycling.

Dr. Holbein presented results of feasibility and pilot trials of a demonstration plant at two sites illustrating the potential of the technology to remove and recover metal from contaminated soil, thereby permitting re-use of the treated soil on-site.

One location was the former site of an automotive battery recycling facility and its associated lead smelter which had contributed contamination to the site in the forms of both coarse lead as in electrodes and battery posts, and fine lead as in smelter fly ash. Lead levels as high as 28 per cent have been found in some pockets at the site.

Using Tallon's technology, recovery of both the coarse and fine lead contamination was possible with lead recoveries exceeding 95 per cent. This new approach to remediating contaminated sites appears to be a promising alternative to more costly and less environmentally acceptable options such as disposal of soil at landfill sites.

Both projects are supported by the Environmental Technologies Program

Improved paper recycling through steam-explosion technology

Current technology is not completely satisfactory for the economic recycling of office wastepaper and photocopier paper. The feasibility of using steam-explosion technology for the deinking and recycling of this paper was the topic of a poster presentation by Stake Technology of Norval, Ont. in the Environmental Technology Development section at the 1992 Technology Transfer Conference.

StakeTech's process involves treating paper at a high consistency of 50 per cent using high temperature saturated steam of 190 to 220°C for a short duration of only minutes. Application of this technology to the recycling of selected wastepaper and paperboards was reported on at the 1991 conference.

See ***Steam Explosion*** *back page*

Steam Explosion (continued)

Results of recent technical trials using various combinations of temperature or pressure of the saturated steam and treatment duration in StakeTech's laboratory reactor indicated that steam-explosion treated paper is significantly cleaner when compared to conventional pulping. Measurements were done objectively by computer-assisted image analysis. This was true for paper containing two different photocopier toners.

Up to 90 per cent reduction in ink particle area and number could be achieved without the use of any chemicals during deinking. Although steam-explosion resulted in some loss of brightness of the pulp, much of this was easily handled by a simple washing procedure.

Pulp quality could be further improved by using a surfactant or cleansing agent during steam-explosion or in post-explosion treatment. Pulps of high brightness and low dirt count could be readily achieved.

Reduction in paper fibre length was also minimal with significant reduction observed only for samples processed at upper limits of operating temperature and process duration. Fibre length is important as it dictates the type of recycled paper product for which the deinked pulp can then be used.

On the basis of these trials, the potential of using steam-exploded photocopy paper in tissue applications appears promising. It may also be suitable for printing and writing purposes. Further work will be carried out with other types of surfactant or chemicals to determine potential process improvement, and to study the application of the steam-explosion technology to mixed office waste which will better reflect the raw material likely to be encountered in a commercial process.

This project is supported by the Environmental Technologies Program

The Proving Ground is published four times annually by the Ministry of Environment and Energy through its Research and Technology Branch (RTB). The RTB coordinates and promotes ministry research programs, supports the development of innovative environmental technologies, and encourages the application of research results and technology developments to policy, planning and regulatory processes.

In profiles and feature articles, *The Proving Ground* reports on significant environmental research and technology development projects and events related to the ministry's mandate. These projects are usually being conducted under the ministry's Environmental Research and Environmental Technologies Programs.

Profiles may feature one part only of what are large, often multi-year projects. Caution should be exercised in extrapolating objectives, results or conclusions out of their original context or that in which they are presented here.

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